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<p>(21) International Application Number: PCT/GB90/00190 (22) International Filing Date: 8 February 1990 (08.02.90) (30) Priority data: 8902851.8 9 February 1989 (09.02.89) GB (71) Applicant (for all designated States except US): COIN CONTROLS LIMITED [GB/GB]; New Coin Street, Royton, Oldham, Lancashire OL2 6JZ (GB). (72) Inventor; and (75) Inventor/Applicant (for US only) : BELLIS, Robert, David [GB/GB]; Hey Barn Farm, Delph, Nr. Oldham, Lancashire O03 5RN (GB). (74) Agents: READ, Matthew, Charles et al.; Venner Shipley & Co., 368 City Road, London EC1V 2QA (GB).</p>		<p>(81) Designated States: AT (European patent), AU, BE (European patent), CH (European patent), DE (European patent), DK (European patent), ES (European patent), FR (European patent), GB (European patent), IT (European patent), JP, LU (European patent), NL (European patent), SE (European patent), US.</p> <p>Published <i>With international search report.</i> <i>Before the expiration of the time limit for amending the claims and to be republished in the event of the receipt of amendments.</i></p>
<p>(54) Title: COIN PAYOUT DEVICE</p> <div data-bbox="516 1136 1333 1814"></div> <p>(57) Abstract</p> <p>A coin payout device consists of a horizontal coin storage tube (1) which receives coins from a coin feed/payout device (3). The resulting column of coins in the tube (1) pushes against a spring loaded plunger (2) which operates an optical shaft encoder (5, 7, 9) to provide a digital signal indicative of the number of coins in the column. The coin feed/payout device consists of a rotary drive member (12) driven by electric motor (13), which upon rotation in a first direction captures a coin and inserts it into the tube (1) and upon rotation in the opposite direction, removes a coin from the tube for payout.</p>		

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COIN PAYOUT DEVICE

FIELD OF THE INVENTION

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This invention relates to a coin payout device and, has particular but not exclusive application to an amusement machine with payout (AWP).

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BACKGROUND

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In a conventional AWP, coins inserted into the machine are firstly validated by an electronic validator and then passed into a coin store. Some of the coins, however, are passed to a payout device to enable prizes to be dispensed when the machine player wins a prize. A conventional payout device consists of a vertically extending tube that receives coins from the validator at its uppermost end, and a solenoid operated payout device which dispenses coins from the tube under the control of a microprocessor when the player of the machine wins a prize. Conventionally, the level of coins in the tube is maintained so as to exceed a minimum limit by means of a sensor which is either

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fixed or slidably mounted on the tube to detect the level of coins therein.

Periodically, the coin store is emptied by an engineer
5 by opening a locked door on the machine and there is a risk that when the door is opened, a few coins will be removed illegally from the coin payout tubes, which will not necessarily be detected by the coin level sensor.

10

SUMMARY OF THE INVENTION

In order to overcome this problem, the present invention provides a coin payout device comprising coin
15 receptacle means to receive coins arranged face to face in a row, means for feeding coins into said coin row in the coin receptacle means, means for paying out coins from the receptacle means, a movable member to be displaced along the coin receptacle means in dependence
20 upon the number of coins in the row, and position detecting means for detecting the position of said movable means to provide a signal indicative of the number of coins in the row.

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Thus, in accordance with the present invention, an electrical signal indicative of the number of coins in the payout tube is provided, which can be monitored by the central processor of an amusement machine in order to determine whether coins are illegally removed from the coin payout device.

Preferably, the coin receptacle means comprises a tube and the position detecting means comprises a digital shaft encoder which detects the position of the movable member along the length of the tube. Conveniently, an optical shaft encoder is utilised.

Another disadvantage with conventional coin payout devices is that the payout tubes extend vertically within the AWP, which takes up a significant amount of space.

In accordance with the present invention, the coin receptacle means can comprise a tube disposed horizontally or at a non-vertical angle to the horizontal, with the significant advantage that a much more compact payout device is provided.

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Conveniently, the movable member comprises a plunger slidably mounted in the tube and biased by a spring from one end thereof.

5 The coin payout device may be provided with coin feeding and paying out means may comprises a rotary member arranged to receive a coin in a first rotary position thereof and rotatable in a first direction to a second rotary position whereat the coin is inserted
10 into the tube. The rotary member may also be rotatable in a second direction to cause payout of a coin from the tube.

15 Alternatively a linear, reciprocating device can be used instead of the rotary member.

BRIEF DESCRIPTION OF THE DRAWINGS

20 In order that the invention may be more fully understood an embodiment thereof will now be described by way of example with reference to the accompanying drawings in which:

- 5 -

Figure 1 is a schematic perspective view of a coin payout device in accordance with the invention;

Figure 2 is a schematic elevational view of a rotary member, taken in the direction of arrow A-A' of Figure 1, with the position of the coin payout tube being shown in dotted outline;

Figure 3 is a vertical section taken along the line B-B' of Figure 1;

Figure 4 is a horizontal sectional view taken along the line C-C' of Figure 1; and

Figures 5, 6 and 7 illustrate operation of the device.

DETAILED DESCRIPTION

Referring firstly to Figure 1, the payout device consists of a coin receptacle in the form of a payout tube 1, in which a movable member comprising a plunger 2 is slidably received for movement along the length of the tube. A coin feed/payout device 3 feeds coins into the left hand end of the tube 1 shown in Figure 1. As a result, a row of coins, arranged face to face (not shown in Figure 1) becomes established in the tube 1 extending from the feed/payout device 3 and the slidable plunger 2. The spring 4 extends between the

- 6 -

right hand end of the tube 1, which is closed, to the
plunger 2, in order to bias the plunger against the row
of coins. As a result, the position of the plunger 2
along the tube 1 is determined by the number of coins
5 in the row.

A position marker post 5 is attached to the plunger 2
and extends through a longitudinal slot 6 formed in the
tube 1. The marker post 5 is used to operate an eight
10 bit optical shaft encoder, of a type which is known
per se, in order to detect the position of the plunger
2 and hence the number of coins in the tube 1.

The shaft encoder is shown in more detail in Figure 3
15 and consists of an elongate strip 7 which is formed
with a digital code comprising eight parallel strips 8
that comprise digital code bits defining 256 unique
positions along the length of the slot 6. The code is
not shown to scale in Figure 3. The code is defined by
20 transmissive and non-transmissive portions of the strip
7 and is illuminated by a back light (not shown). The
marker post 5 is provided with eight photodetectors
which detect whether light is being transmitted through
a relevant part of the eight tracks 8 on the member 7.

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Thus, the outputs of the sensors 9 provide an eight bit digital signal which defines a unique position along the length of the slot 6, in dependence upon the position of the plunger 2.

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As shown in Figure 3, a column of coins 10 is received in the tube 1. Typically, the tube can contain a maximum of a hundred coins; the optical shaft encoder, with its eight bit code, can resolve 256 unique positions along the length of the tube and therefore can resolve coins approximately to $\frac{1}{4}$ a coin thickness. Thus, the eight bit code produced by the shaft encoder provides accurate information as to the number of coins in the tube. The eight bit signal is output on an electrical lead 11 and is typically fed to a system microprocessor in order to monitor the number of coins in the payout tube 1.

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Referring again to Figure 1, the feed/payout device 3 will now be described in more detail. The device consists of a vertically extending support plate 11 on which a rotary, disc shaped coin drive member 12 is mounted. The member 12 is driven by a bidirectional

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dc motor 13 through a shaft 14 mounted in a bearing 15 (Figure 4).

As shown in Figure 1, in use, a coin 10' from a coin validator (not shown) falls in the direction of arrow 16, 16' into the annular space between the drive member 12 and the support plate 11. As will be described in more detail hereinafter, the coin is captured and, upon rotation of the motor 13, is driven to a position to be loaded into the coin payout tube 1. This is achieved by rotation of the drive member 12 in the direction of arrow X shown in Figure 1. Upon rotation of the motor in the opposite direction (arrow Y) a coin is removed from the tube 1 for payout purposes. An annular wall 17 is formed on the support plate 11 surrounding a portion of the periphery of the drive member 12 so as to prevent coins from falling between the space between the member 12 and the support plate 11. Referring to Figures 3 and 4, the payout tube 1 extends through an aperture 18 in the support plate 11 to enable coins to be inserted and removed from the annular space between the drive member 12 and support plate 11.

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From Figure 2, it will be seen that the rear face of the drive member 12 includes a plane rear face 12a formed with three annular vanes 19, 20, 21 which mesh with castellations 22, 23, 24, 25 formed on the end of the payout tube 1, the location of which is shown in dotted outline in Figure 2. The meshing relationship of the vanes 19 to 21 and the castellations 22 to 25 can be seen in more detail in Figure 4.

Referring again to Figure 2, the vanes 19 to 21 do not extend in a complete circle around the face 12a, so as to define a coin receptacle 26 for receiving a coin travelling along a path 16, 16' from the coin validator. In Figure 2, a coin 10" is shown received in the coin receptacle 26. On one side of the receptacle 26, the vanes 19 to 21 are formed with inclined end portions 27, 28, 29 which, as will be explained hereinafter, facilitate insertion of the coin 10" into the payout tube 1. Also, on the opposite side of the receptacle 26, the vanes 19 to 21 are formed with orthogonal ends 30, 31, 32 in order to facilitate removal of a coin from the payout tube 1.

- 10 -

Referring to Figure 5, which shows a section along the line D-D' of Figure 2, upon rotation of the drive member 12 in the direction of arrow X, the coin 10" in receptacle 26 is moved into alignment with the end of the payout tube 1, thereby achieving the configuration shown in Figure 6. The inclined portions 27 to 29 of the vanes 19 to 21 (Figure 2) then operate to insert the coin 10" into the payout tube 1. The operation of the vane 20 and its associated inclined portion 28 can be seen from Figure 6 wherein the coin 10" engages castellation 23 (together with the other castellations 22, 24, 25 not shown in Figure 6) and is urged into the tube 1 by the inclined end portion 28 on vane 20, against the force of spring 4 (Figure 1) As shown in Figure 7, the member 12 is then rotated further in the direction X so as to return the coin receptacle 26 to the upright position shown in Figure 2, ready to receive the next coin from the validator.

To achieve payout of a coin, the drive member 12 is rotated in the opposite direction i.e. in direction Y and it will be appreciated that the reverse sequence of events occurs whereby upon rotation of the receptacle 26 past the end of the tube 1, the spring 4 forces the

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coin 10" into the receptacle and it is then carried by the orthogonal ends 30, 31, 32 until the coin falls from the receptacle 26 by gravity in the direction of arrow 33 (Figure 2). A further payout can be achieved by rotating the drive member 12 through a further revolution. After payout, the coin receptacle 26 is returned to the vertical position shown in Figure 2, in order to receive a further coin from the validator.

A significant advantage of the described embodiment of the invention is that the coin payout tube 1 can be disposed horizontally thereby resulting in the device according to the invention being positioned immediately underneath the validator (not shown), which takes up significantly less space than the payout devices used hitherto since, conventionally, the payout tubes are arranged vertically and extend for a significant vertical length of the amusement machine. As a result, a much more compact amusement machine can be provided.

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Furthermore, the use of the optical shaft encoder 5, 7, 9 permits the number of coins in the payout tube 1 to be monitored extremely accurately such that the loss of

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individual coins from the coin payout tube can be monitored.

Another advantageous feature of the invention is the
5 rotary coin feed/payout device for the tube, which permits a reliable loading of coins into the tube, and also facilitates rapid and accurate dispensation of coins during payout.

10 Modifications and variations falling within the scope of the invention will be apparent to those skilled in the art. Thus, whilst the invention has been described in relation to an optical shaft encoder using a relatively transmissive and non-transmissive digital
15 code on a member 7, it will be appreciated that a reflective arrangement could be used instead. Also, it will be understood that other forms of shaft encoder could be utilised, for example using magnetic strips or other forms of coding. Furthermore, the rotary coin
20 feed/payout device could be replaced by a linear, reciprocating device in order to load and payout coins from the tube.

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CLAIMS

1. A coin payout device comprising coin
5 receptacle means to receive coins arranged face to face
in a row, means for feeding coins into said coin row in
the coin receptacle means, means for paying out coins
from the receptacle means, a movable member to be
displaced along the coin receptacle means in dependence
10 upon the number of coins in the row, and position
detecting means for detecting the position of said
movable means to provide a signal indicative of the
number of coins in the row.
- 15 2. A coin payout device according to claim 1
wherein the coin receptacle means comprises a tube.
3. A coin payout device according to claim 2
wherein the position detecting means comprises a
20 digital shaft encoder which detects the position of the
movable member along the length of the tube.

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4. A coin payout device according to claim 3 wherein said encoder comprises an optical shaft encoder.

5 5. A coin payout device according to claim 2, 3 or 4 wherein the tube is disposed horizontally or at a non-vertical angle to the horizontal.

10 6. A coin payout device according to any of claims 2 to 5 wherein the movable member comprises a plunger slidably mounted in the tube and biased by a spring from one end thereof.

15 7. A coin payout device according to any one of claims 2 to 6 wherein the coin feeding means comprises a rotary member arranged to receive a coin in a first rotary position thereof and rotatable in a first direction to a second rotary position whereat the coin is inserted into the tube.

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8. A coin payout device according to claim 7 wherein the rotary member is rotatable in a second direction to cause payout of a coin from the tube.

- 15 -

9. An amusement machine including a coin payout device according to any preceding claim, and electronic processors responsive to said signal indicative of the number of coins for controlling operation of the means
5 for paying out coins from the receptacle means.

$\frac{1}{4}$

FIG. 1.

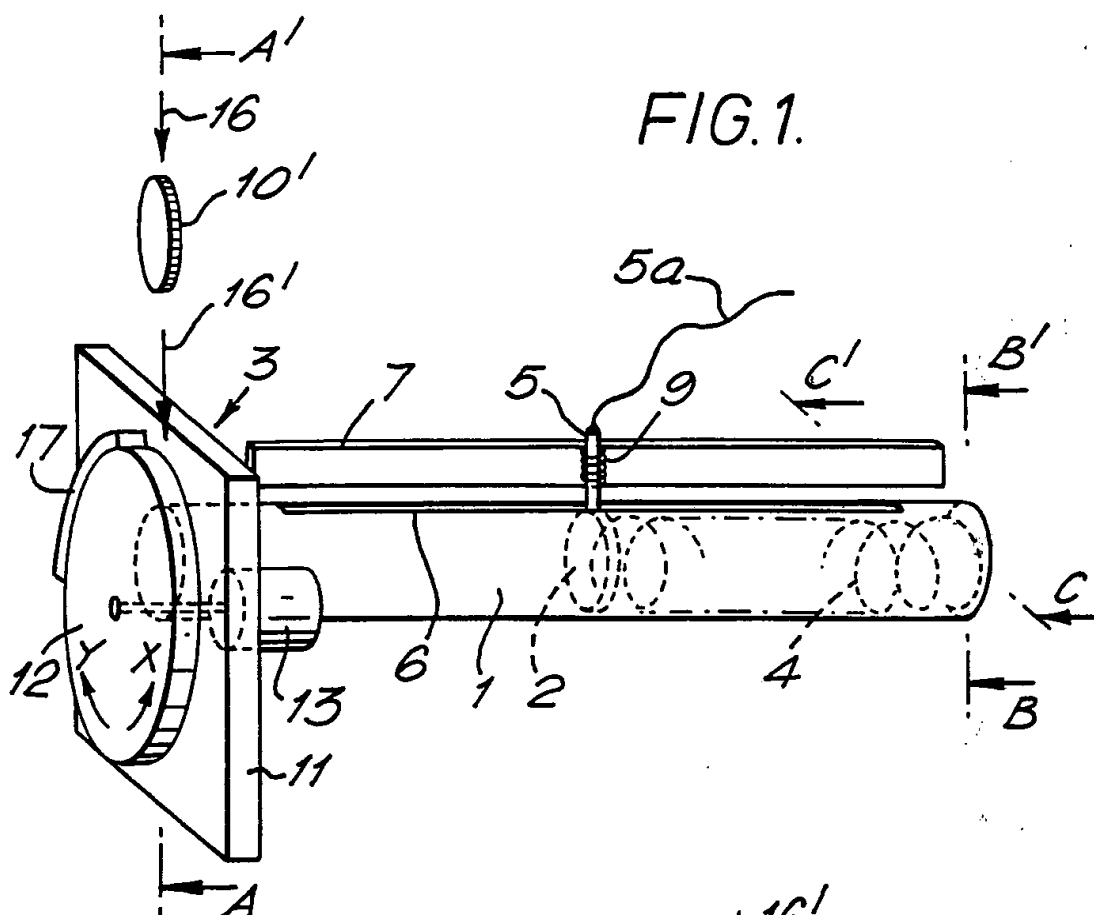
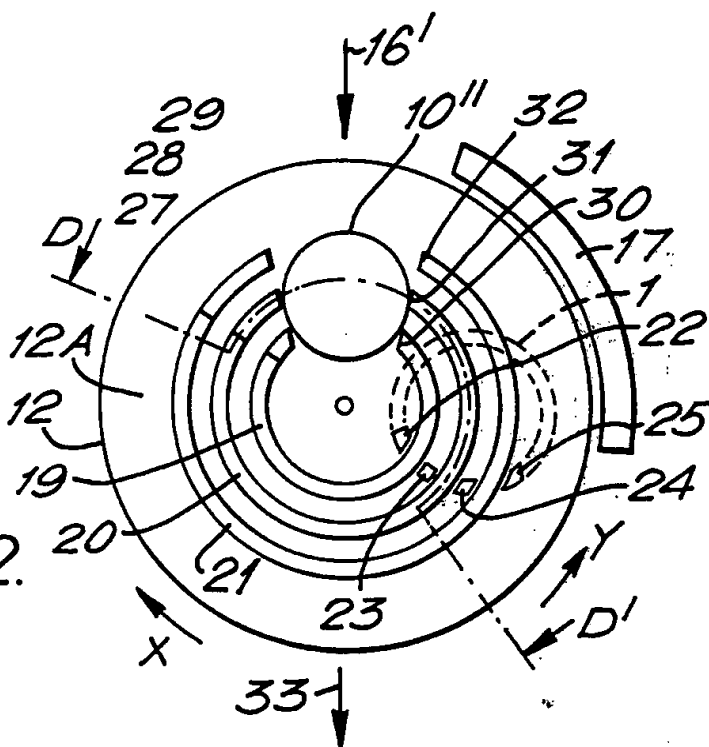


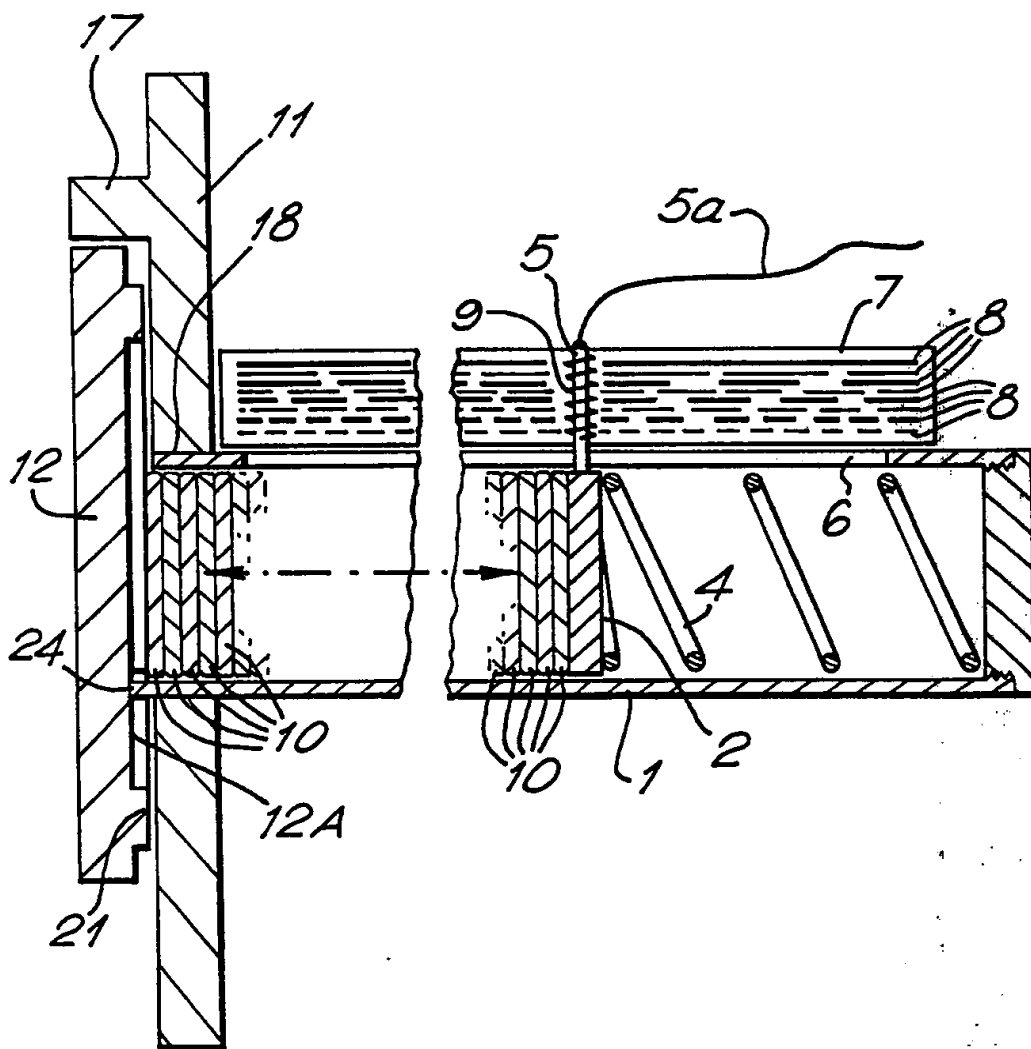
FIG. 2.



SUBSTITUTE SHEET

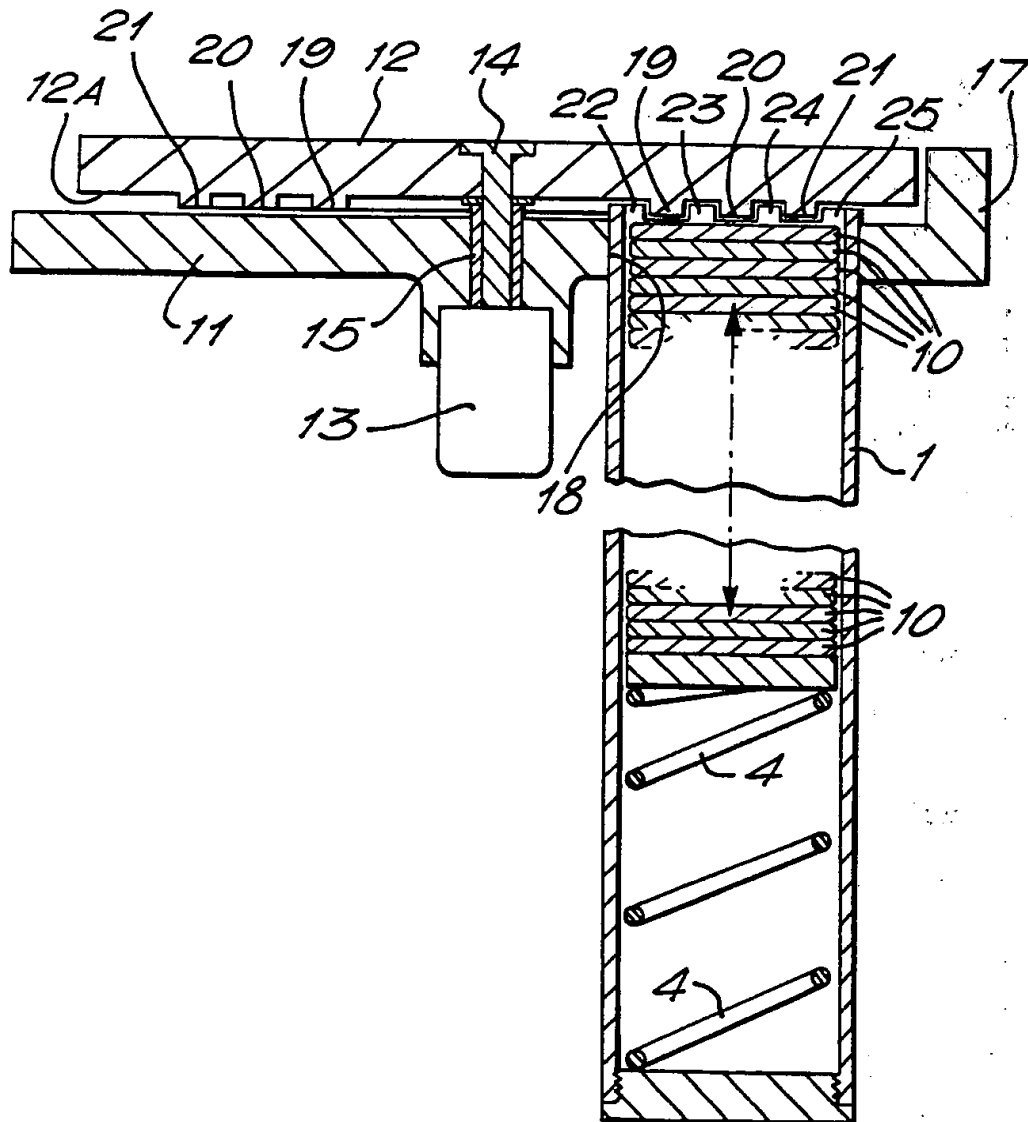
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FIG.3.

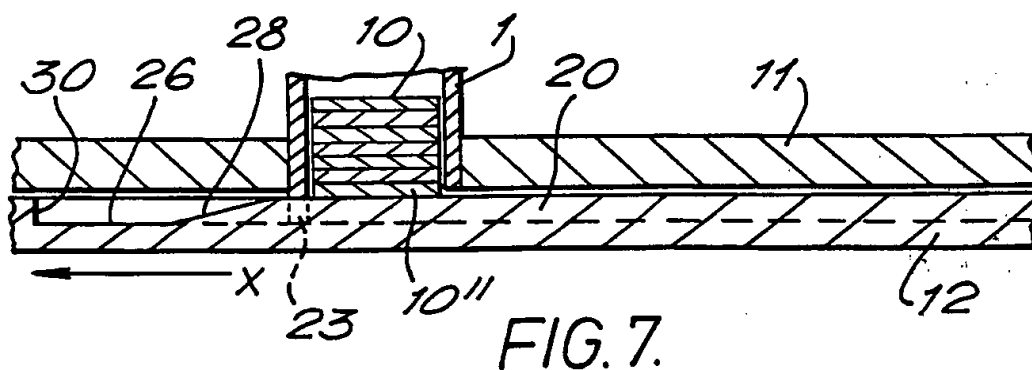
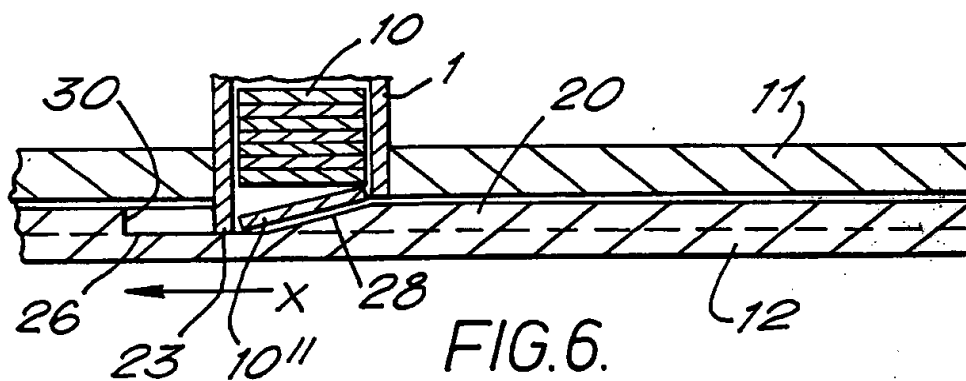
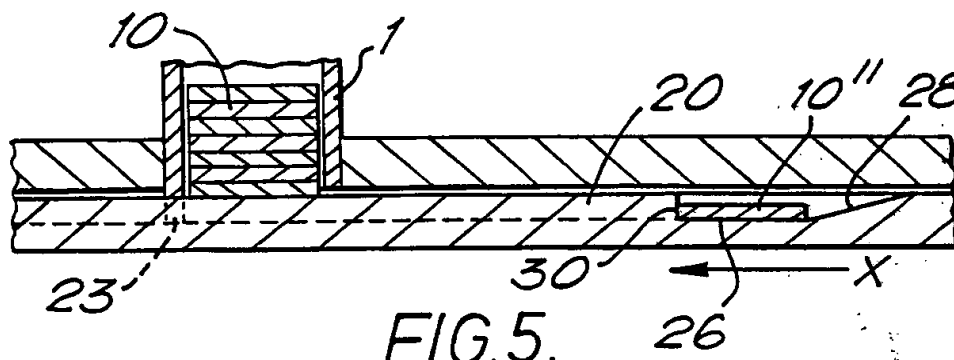


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FIG. 4.



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INTERNATIONAL SEARCH REPORT

International Application No

PCT/GB 90/00190

I. CLASSIFICATION OF SUBJECT MATTER (If several classification symbols apply, indicate all) ⁶		
According to International Patent Classification (IPC) or to both National Classification and IPC Int.Cl. 5 G07F5/24 ; G07D9/04		
II. FIELDS SEARCHED		
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Classification System	Classification Symbols	
Int.Cl. 5	G07F ; G07D	
Documentation Searched other than Minimum Documentation to the Extent that such Documents are Included in the Fields Searched ⁸		
III. DOCUMENTS CONSIDERED TO BE RELEVANT⁹		
Category ¹⁰	Citation of Document, ¹¹ with indication, where appropriate, of the relevant passages ¹²	Relevant to Claim No. ¹³
Y	DE,B,2705495 (LANDIS & GYR) 24 May 1978 see column 4, lines 28 - 37; claims 1-4; figures 1, 2, 5	1, 2, 6
A	---	5, 7, 8
Y	DE,A,2423688 (LICENTIA PATENT) 27 November 1975 see page 7; claim 8; figures 1-5	1, 2, 6
A	---	1-3, 9
A	DE,U,8810880 (NSM-APPARATEBAU) 29 December 1988 see page 14, line 4 - page 15, line 5; figures 4, 5	
A	---	
A	DE,A,3543186 (GAUSELMANN) 11 June 1987	
A	---	
A	EP,A,0173119 (AUTELCA) 05 March 1986	
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IV. CERTIFICATION		
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17 MAY 1990	12. 06. 90	
International Searching Authority	Signature of Authorized Officer	
EUROPEAN PATENT OFFICE	DAVID J.Y.H.	

**ANNEX TO THE INTERNATIONAL SEARCH REPORT
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SA 34158

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Patent document cited in search report	Publication date	Patent family member(s)	Publication date
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		FR-A, B 2392454	22-12-78
		GB-A- 1549580	08-08-79
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DE-A-2423688	27-11-75	None	
DE-U-8810880	17-11-88	DE-U- 8800692	05-05-88
DE-A-3543186	11-06-87	None	
EP-A-0173119	05-03-86	CA-A- 1235609	26-04-88
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